Title: APPLICATION SPECIFIC LIVE STREAMING MULTIMEDIA MIXER APPARATUS, SYSTEMS AND METHODS

Abstract: Multimedia mixing (fig. 11) and synchronization systems and methods are provided and include a plurality of multimedia sources (1, 9, fig. 11) including, streaming video, audio and content data, which are mixed together via a multimedia software mixer to generate a single streaming synchronized output. The audio/video signals are streamed through a software filter (4, fig. 11) to eliminate any echo and background noise resulting from mixing the multimedia sources (1, 9, fig. 11).
For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.
APPLICATION SPECIFIC LIVE STREAMING MULTIMEDIA MIXER APPARATUS, SYSTEMS AND METHODS

1. BACKGROUND OF THE INVENTION

The present invention relates to mixing two or more live streaming multimedia sources on a single channel for broadcasting, recording and/or conferencing. More particularly, the present invention relates to apparatus, systems and methods for the handling of audio video and other data generated by a streaming multimedia source, including, but not limited to video data flows, audio data flows, video frames, point-to-point and multipoint communications, standard recording, broadcasting, conferencing, distance learning or tele-training. The mixing software system of the present invention facilitates merging and synchronizing of incoming live streaming signals from different content sources into a single multimedia output stream.

It has become possible to provide telecommunications bandwidth to business and individuals for use in interactive video communication (also known as "interactive multimedia" communications) which permits video, audio and other data to be transported from one part to another or others. Currently available automated home or office equipment has the capacity to create, send and/or receive different types of communications such as voice, image (black/white or color) or video in a streaming format. For example, the computer is provided with operated software that enables the device to send, stream and receive voice or audio content, image text or binary messages via the Internet.

Despite these advances, currently available systems of the art require large
and expensive high-end servers with specialized applications and bandwidths lines for merging and routing together all of the audio, video and other data, to the multimedia bridge in multimedia conferencing applications. Other available systems reduce the process required by the multimedia bridge by multicasting capabilities of the ATM network. Some of these systems separately route and handle the audio and video components of the multimedia conference and process and synchronize them by an interface module at the destination before transmitting them to the audio/video terminal. As such, conventional systems are unable to process different types of multimedia streaming sources to create a single symphonized stream contains multiple multimedia sources.

2. SUMMARY OF THE INVENTION

It is therefore an object of the present invention to provide a multimedia transmission and/or recording system which mixes multiple live streaming multimedia sources on a single streaming channel at the end-user system level.

It is another object of the invention to provide a mixing mechanism for synchronizing the various multimedia content in multiple streaming sources. Various synchronization mechanisms for the audio and video data streams may be utilized, ranging from mechanisms which are simple to implement, to mechanisms which require significant information about a network.

It is a further object of the invention to bind together multiple different live captured streaming multimedia contents or sources into a single synchronized stream.

According to the invention, these capabilities are achieved through the
provision of software mixer systems for facilitating the merging and synchronizing of incoming live captured multimedia-streaming signals having different content sources, into a single synchronized output stream.

The invention further enables the system to utilize and tunnel the multimedia streaming sources simultaneously like playing two audio signals on a single player.

According to the invention, the focal point of the software mixer mechanism is the mixing of the multimedia content while streaming from one computing device to a remote computing device. "Computing device" as used herein represents any equipment having a processor random access memory (RAM) and telecommunication capability, such as the desktop, laptop PC, Hand Held Computer or personal digital assistant (PDA).

The software mixer of the present invention enables a user to carry out a digital live recording of a 2-way Full-Duplex Conversation comprising of two or more incoming live captured streaming audio signals from opposite directions and reroute the merged signal either to a computer storage file or to broadcast it in a streaming media format to a third or more destinations.

In another aspect, the software mixer according to the present invention further provides the capability to impose a first set of live captured audio and video streaming signals on top of a second set of multimedia streaming signals, and further stream the two sets of signals in a synchronized mode in an output direction.

The invention further provides a software filter, during the process of tunneling, which cancels any captured echo or background noises that may result when several multimedia sources are mixed for broadcasting, recording or
conferencing.

As used herein, conferencing includes real-time audio and or video teleconferencing, as well as data conferencing. Data conferencing, in turn, includes snapshot sharing of the user’s screen, application sharing of running applications, whiteboard sharing equivalent to sharing a blank window and associated capabilities. Teleconferences may be real-time or may be recorded and stored for later broadcasting or playback, including audio, video and data interactions.

The system architecture employs real-time point-to-point and synchronous networks-real-time for real-time audio and video, and asynchronous for non-real-time audio, video, text, graphics, data interactions.

The system architecture employs real-time point-to-point and asynchronous networks-real-time for real-time audio and video, and asynchronous for non-real-time audio, video, text, graphics, data and control signals.

The system architecture accommodates the situation in which the user’s computer provides varying levels of media-handling capability, for example, an interactive session – whether real-time or asynchronous – may include participants whose computers provide only data or whose equipment provide only audio to a real-time, high-fidelity audio and video, and high-speed data network facilities. This multimedia system architecture is scalable to large network environments accommodating large number of users. Further, it is an architecture that can accommodate appropriate standards. The networks are interoperable across different computers, for example, Intel-based PCs, Macintosh and Sun workstations; operating systems, for example Apple 7, Microsoft/Windows and UNIX; and network
operating systems, for example, Novell Netware. Finally, the system architecture – the echo canceling filter and the live streaming media synchronization mixer – supports the synchronization and merging of multiple media streaming sources in different formats, into a combined output stream, making the system provide a high-fidelity audio and full-motion video. The specific nature of the invention, as well as its objects, features, advantages and uses will become more readily apparent from the following detailed description and examples, and from the accompanying drawings.

3. BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a block diagram describing the SW Filter adapted to capture multimedia including audio from a microphone and data from a data source.

Fig. 2 is a flow diagram for explaining the operation of the Fig. 1 embodiment.

Fig. 3 is an example of implementing the SW filter for capture an audio signal by a microphone and process it for streaming transmission.

Figs. 4, 5, 6, 7 and 8 are examples of the capture, filter and display of multimedia having been subjected to the software mixer and the echo canceling filter respectively.

Fig. 9 is a block diagram describing the layout of the SW Streaming multimedia mixer.

Fig. 10 is a block diagram describing an example of the application of SW Streaming multimedia mixer for a recording operation or transmission through the line.
Fig. 11 is the block diagram representing the SW mixer components in a recording operation

Fig. 12 is the block diagram representing the SW mixer components in a transmission operation

Fig. 13 describes the flow of operation for a streaming content recording.

Fig. 14 describes the states of the mixer in a recording operation

Fig. 15 describes the flow of operation for a streaming content transmission

Fig. 16 describes the states of the mixer in a transmission operation

4. DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

The following sets forth a detailed description of the best-foreseen mode for carrying out the invention. This description is intended to be illustrative of the invention and should not be taken to be limiting.

Referring to Fig. 1, a schematic block diagram illustrates a memory buffer system 4, a suitable filter system 5 and a plurality of streaming multimedia sources such as the microphone 2 through data source 3, to an output data source 6 and the RTP session manager 7.

The major building blocks of the SW filter enable the system to cancel and clean the echo and background noises from a captured audio signal by the system microphone. For example, microphone 2 captures the incoming audio signal capture into an input buffer. Data source 3 comprises, an array that records all the content and information of the captured audio signal. A memory buffer 4 comprises the digital representation of the captured analog audio signal. The filter 5 comprises a
processor that operates and adapts the values of the memory buffer content to the required level of a pre-set filter value. Output data source 6 comprises an array that records the modified buffer array after being processed by the filter. RTP session manager 7 comprises a conversion of the output data source to the required RTP protocol format and streams it to the communication line.

In Fig.2 provides a flow chart describing a process flow of the SW filter and methods and systems that enable the SW filter to cancel the echo and the background noise of a captured input audio streaming signal. Briefly, an input buffer 8 contains the incoming signal content. Next, a conversion processor 9 converts the signal to bytes format in 8-bit structure. An initial value setup 10 is located next in the system to control the filtering process loop. The signal reaches the end of the buffer check 11, the end of currently processed portion check 12, and reaches the sum update by the byte value 13. When the signal advances the counter of the process loop 14, incoming audio signal level is checked against a pre-set value of the filter 15, and finally reaches the background noise silencer 16.

The signal after reaching the buffer check 11, can be reproduced by the reproducer of the incoming audio signal to the output array 17 and eventually. Advance to the buffer portions pointer 18. After the signal passes through the initial value setup 10, it may pass through the last buffer portion handler 19, the background noise silencer 20, and/or the reproducer of the incoming audio signal to the output array 21. The signal that passes through the background noise silencer 20, then proceeds to the cut array copier 22, and/or the output streaming buffer 23.

The SW filter operation is carried on the information stored in the input buffer 8 of the capture device. Upon receiving of the content buffer a conversion process 9
to bytes format in 8-bit structure takes place. The filter process is carried out on a loop operation on the bytes of the input buffer array wherein is set the initial values 10 to zero for a sum accumulator for the values of the content of each byte in the portion of the input array that is being filtered, the pointer to byte that is being processed and the pointer to the portion of the buffer. At each iteration of the loop a check for reaching the end of the input array buffer 11 is carried out. In case that the end of the input array buffer has not been reached, a check for reaching the end of current portion 12 that is being processed is carried-out. If the end of the current portion is not reached, the sum accumulator is updated at 13 by the value of the content of the current byte "i" and the pointer of the byte is advanced to the next step at 14. If the end-of-portion is reached the average value of the content of the bytes in the portion is compared to the pre-set value of the filter noise and echo canceling level required by the user at 15. This check at 15 verifies that there is an incoming audio signal at a noise level that is higher than the filter pre-set value signifies that a person is speaking and the microphone doesn’t capture background and echo signals that have lower noise level than the filter pre-set value. If the portion average value of the content of each byte is lower than the filter pre-set value it means that this portion contains background and echo signals and the out array byte value is set to zero at 16 in order to stream silence through the line. If the check in 15 turns to be higher or equal than the pre-set level of the filter it means that a speaking signal is captured by the microphone and the content of the input array byte is copied to the out array buffer at the same pointer location 17. At the end of the portion processing the sum accumulator of portion bytes content value is set to zero and filter moves to the next portion to process and cancel the echo and the background noises at 18. At stage 19 the handling of the last portion is carried-out in similar way to the check that
is done at 15 where a verification of the portion average value of the content of each byte is lower than the filter pre-set value. If the average value is lower, then the output array bytes of the last portion are set to zero to silence the echo and background noises 20. In case that the average value is higher or equal to the filter pre-set value, the content of the last portion bytes of the spoken captured signal is moved to the output buffer bytes 21. After processing the entire buffer of the incoming captured audio signal the filter out buffer array of bytes is moved to the output buffer of the RTP session manager 22. At 23 an output buffer is ready to be streamed according to the RTP communication protocol format.

Fig. 3 describes the flow of actions of the SW filter from analog signal capture by the system microphone and places an input data source array in a digital format through the filter to the processor for RTP format conversion before eventually streaming it via the communication line.

Fig. 4 is a representation of the byte values of an incoming captured signal in the input buffer 8 (Fig. 2) with an audio talk and silence portions.

Fig. 5 is a representation of the bytes value of an incoming captured signal in the input buffer array 9 (Fig. 2) after computing the absolute value of each byte.

Fig. 6 is a graphic representation of the average value of the absolute value of the bytes of each portion of the incoming audio signal input array buffer 9 (Fig 2).

Fig. 7 is a graphic representation of the incoming audio signal after the filter operation where all the portions that have an average byte value lower than the pre-set level of the filter have been cleaned from the signal at 16,17,21,11 (Fig.2).

Fig. 8 is a graphic representation of the outgoing audio signal that goes to the communication line after filtering and cleaning all the background noises 22 (Fig 2).
Fig. 9 to Fig. 16 describe in detail the streaming multimedia mixer software.

STREAMING MULTIMEDIA MIXER SOFTWARE

Fig. 9 describes the layout of the SW mixer implementation and application wherein two input streams-input 1 and input 2- are merged into a synchronized output stream by a dedicated SW processor.

Fig 10. describes the layout of the Streaming Multimedia SW mixer in 2 applications wherein 2 captured incoming data sources in a streaming format are merged together to a combined synchronized output signal.

The first application is done when the user wish to record into a disk file a live 2WAY Full-Duplex conversation carried out between 2 remote computers or to record a video signal and its' adjacent audio content together with additional audio signal from a different computer.

The second application is used when the user wish to merge to incoming streaming data sources from 2 or more distinct computers and transmit the combined content signal to another computer.

The input data sources for the Streaming Multimedia SW mixer can be a signal captured by a microphone, a video camera or multimedia content that is stored in a computer file.

Fig. 11 describes the building blocks of the Streaming Multimedia SW Mixer in a record operation. Referring to Fig. 11, the different elements of the system include: 1 – a capture device microphone or a video camera; 2 – a data source comprising a memory input array buffer to store the captured signal; 3 – a Clone Data Source comprising a processor that streams the content of the data source input array to two different processors for further processing concurrently; 4 – a filter SW processor used to cancel echo and background from the streamed audio signal;
5 – a RTP processor which converts the data stream of the captured audio signal into RTP format in order to stream and transmit the content through the communication line.; 6 – a RAW processor which converts from RTP format into a format that the content can be played directly or stored in a memory buffer array for further processing like filtering or compression; 7 – a Clone Data Source similar to 3; 8 – a Player used to play and display multimedia content; 9 – a Loudspeaker; 10 – a Merge Data Source which unifies 2 data sources into a single synchronized streaming signal; 11 – a Wave Processor converts from content raw format to wav format in order to store in a file; 12 – a Data Sink comprising a processor that writes the multimedia content into a disk file storage; and 13 – a File, containing the recording.

The process of recording a 2WAY Full-Duplex live conversion between 2 distinct computers is based on cloning the outgoing data stream before it is piped to the SW filter and into the line, and the incoming data stream before it is routed to the player; and directing them to merge data source processor to create a combined streaming signal to be stored in disk file.

Fig. 12 – describes the building blocks of the Streaming Multimedia SW Mixer in a transmit operation. Referring to Fig. 12, the individual components include: 14 – a capture device microphone or a video camera; 15 – a data source comprising a memory input array buffer to store the captured signal; 16 – a Clone Data Source comprising a processor that streams the content of the data source input array to two different processors for further processing concurrently; 17 – a Filter SW processor to cancel echo and background from the streamed audio signal; 18 –a RTP processor which converts the data stream of the captured audio signal into RTP
format in order to stream and transmit the content through the communication line; 19 – a RAW processor which converts from RTP format into a format that the content can be played directly or stored in a memory buffer array for further processing like filtering or compression; 20 – a Clone Data Source similar to 3; 21 – a Player to play and display multimedia content; 22 – a Loudspeaker; 23 – a Merge Data Source which unifies 2 data sources into a single synchronized streaming signal; 24 – a RTP processor similar to 18.

The process of transmitting a 2WAY Full-Duplex live conversion between 2 distinct computers to a third computer is based on cloning the outgoing data stream before it is piped to the SW filter and into the line and the incoming data stream before it is routed to the player and directing them to merge data source processor to create a combined streaming signal to be transmitted to a third or additional computers.

Fig – 13 describes the mixer record operation where the status request is set to 'false' and upon the activation of the record request button the record status is converted to 'true'. As long as the record request status is 'true' the writing of the merged streaming content is carried-out until the request button is pressed to stop the position and the request status is again converted to 'false'.

Referring to Fig. 13, the operational steps include: 25 – to set initial record status to 'false'; 26 – to record button activation – press the designated button to start the recording into to a file or stop it; 27 – to change the record status to the opposite status 'true to false and false to true' in order to start or stop the recording according to the user activation of the button; 28 – to check if the record status is true (on position); 29 – if result of the check in 28 is ‘true’ start the recording to write
the merged data sources into a file; and, 30 – if the result of the check in 28 is ‘false’ stop the recording – close and save the file.

Fig. 14 describes the states of the recording operation when the user activates the record button and the entry of the data sink processor into writing the merged data sources to the file. In case that the record button isn’t activated or the stop button is pressed the state of the mixer is entered into “NoOp” state in reference to the activation of the data sink processor.

Fig. 15 describes the transmit operation where the status request is set to ‘false’ and upon the activation of the transmit request button the transmit status is converted to ‘true’. As long as the transmit request status is ‘true’ the transmission of the merged streaming content is carried-out until the request button is pressed to stop position and the request status is again converted to ‘false’.

Referring to Fig. 15, the operational steps include: 31 – Set initial transmit status to ‘false’; 32 – Transmit button activation by pressing the designated button to start the transmission through a communication line or stop it; 33 – Change the transmit status to the opposite status ‘true to false and false to true’ in order to start or stop the transmission according to the user activation of the button; 34 – Check if the transmit status is true (on position); 35 – if result of the check in 34 is ‘true’ start the transmission by writing the merged data sources into the communication processor; and 36 – if the result of the check in 34 is ‘false’ stop the transmission by shutting down the communication processor.

Fig. 16 describes the states of the transmission operation when the user activates the transmit button and the entry of the RTP processor into sending the merged data sources through the communication line. In case that the transmit
button isn’t activated or the stop button is pressed the state of the mixer is entered into “NoOp” state regarding to the activation of the RTP communication processor.

The present invention therefore provides apparatus, systems and methods for options, including, but not limited to, of live recording and or live transmission of a streaming 2 way full duplex live conversation.

OPTIONS

**Live Recording of a Streaming 2WAY Full-Duplex Live Conversation**

After setting up the connection with a user’s computer as described above, the user presses the record request activation. The system responds by activating the data sink processor to write the recorded content from the data merge processor into a disk file. The system denotes the recording file with an automatic generation of a file name and a default folder. In addition, the user has the option to store the recording under any file name and in any folder the user wishes through a dedicated interface to the computer file system like any other information file.

**Live Transmission of a Streaming 2WAY Full-Duplex Live Conversation**

After setting up the connection with the user’s computer as described above, each of the participants can decide to transmit the conversation to a third destination. The transmission can take place to a different user who is logged online to a network or to a server for further multicasting to other destinations. The user specifies the destination address by various schemes of identification and the system will translate it to the appropriate IP address. The user at the receiving end has the option to record the transmission on user’s computer or to take part in the conversation in a conference mode.
TECHNOLOGY - The technology of the Streaming Multimedia SW Mixer is based on the implementation of a SW processor that is capable of carrying out the several tasks, including, but not limited to: (a) Store streaming multimedia content in a memory array buffer as temporary storage to carry-out the required processing; (b) Cloning a memory array buffer that contains the multimedia streaming content to one or more memory array buffers; and (c) Merging two memory array buffers into one stream of multimedia content.

At the capture phase, at every 20 micro seconds, the amplitude of the incoming signal is sampled and its' voltage value is stored in the data source memory array buffer. When a mixer operation is taking place the first stage is to clone the data source memory arrays into the buffer of the merge data processor where the values of each byte of the two cloned contents is summed and stored in the output memory array buffer bytes in the relative position according to the pointer scanning the cloned arrayed of the incoming signals. The combined signal is synchronized according to the scanning pointer of the cloned data sources arrays buffer. Once the merged signal is stored in the output array of merge data source processor it is ready to be processed according to the user request by the wave processor to be prepared for writing in the disk file by the data sink processor or the RTP processor for transmission to distinct IP address destination.

The live streaming multimedia mixer apparatus, systems and methods of the present invention have a number of applications, including, but not limited to recording a live conversation that is carried on 2 channels, transmitting a live conversation to a different destination or a 2 way full duplex live conversation record and transmit combined operation.
Record a live conversation that is carried on 2 channels

Recording a live conversation is carried-out after establishing a streaming talk session between 2 computers connected through a network in 2 different locations. The talk session is done on 2 distinct channels in parallel to enable a 2WAY Full-Duplex live conversation with Out streaming content coming from the capture device. In this case the microphone and In streaming content come from the communication line and are directed to the player and on to loudspeakers. As the user activates the record button each streaming content is cloned to its' designated input array buffer in the merge data source processor. Here, it is be merged into a combined output streaming content. On the output side of the merge processor the combined streaming content is moved to the wave processor for a conversion either to WAV format or to any other requested. From the wave processor the signal is transferred to the data sink processor for writing in a disk file. The cloning of the 2 streaming signals and the merger to a combined streaming content for storing in a disk file takes place until the user presses the stop button or a program issues a stop recording instruction.

Transmit a Live Conversation to a different destination

Transmitting a live conversation to one or more different destinations is carried-out after establishing a streaming talk session between 2 computers connected through a network in 2 different locations. The talk session is done on 2 distinct channels in parallel to enable a 2WAY Full-Duplex live conversation with Out streaming content coming from the capture device, in this case the microphone and In streaming content coming from the communication line and directed to the player and on to loudspeakers. As the user activates the transmit button each streaming content is cloned to the its' designated input array buffer in the merge data source
processor to be merged into a combined output streaming content. On the output side of the merge processor the combined streaming content is moved to the RTP processor for a conversion RTP streaming format for communication through the network as a streaming content to one or more destinations. The cloning of the 2 streaming signals and the merger to a combined streaming content for transmitting through a communication network takes place until the user pressed the stop button or a program issues a stop transmission instruction.

2-WAY Full-Duplex Live Conversation Record & Transmit combined operation

The record and the transmit options are composed of a similar set of building blocks to the SW processors, for example, blocks to clone data source or to merge data source. The difference is in the output processor. In record option, the data is in sink processor for writing into a disk file. In the transmit option, the RTP processor transmits through the network in a streaming communication format. The SW mixer can perform a recording and transmission of the live conversation concurrently by implementing a set of appropriate processors, 2 or more clone processors and/or 1 or more merger processors. If the user implements 2 or more data source clone processors, 1 or more data merge processors and an additional RTP processor, the user can establish two streaming transmission lines to 2 different destination both at the same time. If instead of using an unicast communication streaming protocol the user uses a multicast communication protocol the user can transmit the 2WAY Full Duplex live conversation to numerous destination simultaneously in addition to the recording operation.
PREFERRED EMBODIMENTS

Example 1. Mixer for Streaming Multimedia Software

A software module that is capable of merging 2 incoming streaming content signals into a combined output streaming signal and to perform various tasks including, but not limited to, the following the tasks: (a) Write the combined streaming signal into a disk file in order to implement a digital recording of 2WAY Full-Duplex Live Conversation or (b) Direct and transmit the Live Conversation as a streaming signal in a real-time mode to a different computer destination.

Example 2. Echo & Background Noises canceling SW

A software module with the capability to filter and cancel echo and background noises that are captured in the microphone at a certain volume intensity that is above a pre-set level set as default by the program or fixed by the user.

Example 3. Veazy program—The talk option with embedded Mixer & Filter SW Module

The Veazy program enables users to use VoiceEaZY Veazy service for Interactive multimedia communication between computers. The Veazy program contains a talk module between 2 or more users with the following capabilities: Establish a 2WAY Full-Duplex live conversation based on streaming communication protocol with the embedded capability of the SW filter to cancel echo and background noises, and the capability of the SW mixer to merge and combine 2 incoming streaming audio signals to perform a digital recording of the live conversation in a computer disk file and/or transmit the content of the live
conversation to a third or additional computers through the network in a streaming format to enable a conference.

Example 4. The Mixer & Filter Program as a JAVA Object

To provide the capabilities of the SW Mixer and Filter programs as independent modules to be integrated in WEB pages or other JAVA application programs for the purpose of merging streaming input signals and contents from different sources to play with an independent JAVA multimedia player and providing an optional recording digitally of the streamed content.

Example 5. The Mixer & Filter Program embedded in ASIC

To implement the capabilities of Streaming Multimedia Mixer and Filter SW in an Application Specific Integrated Circuit to be integrated as an HW module loaded with this specific embedded SW as part of a computing system or device with the capabilities to process a multimedia streaming content.

Although the present invention is described in connection with particular preferred embodiments and examples, it is to be understood that many modifications and variations can be made in hardware, software, operation, uses, protocols and data formats without departing from the scope to which the inventions disclosed herein are entitled. For certain applications, it will be useful to provide some or all of the audio or video signals in digital form. Accordingly, it will be understood that these embodiments are illustrative and that the scope of the invention is not limited to them. The present invention is to be considered as including all apparatus, systems and methods encompassed by the appended claims.
What is claimed is:

1. An application specific live streaming multimedia mixer system comprising:
   (a) multiple locations including at least two locations, wherein said locations comprise of communication signals in a unicast or multicast protocol;
   (b) at least one computer device at each of the locations, each computer device including a processor RAM and audio/video capture and reproduction capabilities arranged to capture and reproduce video images and spoken audio;
   (c) a real-time multimedia software mixer;
   (d) at least two or more multimedia input streams originating from an internet port, capture device, RAM array or computer file and feeding into said multimedia software mixer, to merge and result in a synchronized output; and
   (e) a software filter connected to the multimedia software mixer, said filter eliminating any echo or background noise from the audio signal.

2. The application specific live streaming multimedia mixer system of claim 1, further comprising a software demixer to separate a merged synchronized incoming stream into separate content streams and channels the separate streams to a processor player, recorder or a storage file.

3. The application specific live streaming multimedia mixer system of claim 1, wherein the mixer further streams the synchronized output to an Internet port, IP address destination, storage file or memory array.
4. A method of mixing live multimedia streams origination from at least one participant at each of first and second locations, each location having at least one processor with audio and video capture and reproduction capabilities, the method comprising of steps of:

   (a) linking the first and second locations with several locations, including at least one processor with audio and video reproduction capabilities;

   (b) capturing video images and/or spoken audio at the first and second locations or at any other locations according to the users' needs;

   (c) mixing and synchronizing the signals representing the captured video and audio at the first and second locations;

   (d) routing the mixed and synchronized signals to the third or more locations according to the communication protocol; and

   (e) receiving the routed signals at the third or other locations.

5. The method of claim 4, further comprising step of:

   (a) routing the signals through a software filter to eliminate any echo and background noise.

6. The method of claim 4, wherein the first and second locations are originating from two different Internet IP addresses and the mixed and synchronized signal sent to another location that is a digital recording on a computer storage file or a multimedia player on another computer.

7. The method of claim 4, wherein the multimedia software mixer is capable of mixing and synchronizing a live captured streaming audio signal with a multimedia content such as MP3 and further stream it to a destination
including Internet IP address, Program Port, Memory Array or Computer File.

8. A method of separating a mixed synchronized multimedia streaming content into different component sources using a multimedia software mixer, and streaming said component sources to a file for digital recording, a multimedia player or a Memory Array.
SW Filter for Capture from microphone

Filter Figure 1

2 microphone

3 data source

4 Buffer

5 filter

6 data source

7 RTP session manager
SW Filter Actions
Figure 3

1. capture

microphone audio → microphone → data source → filter → processor → RTP format → streamlining
Figure 9

Streaming Mixer Layout

Output

Mixer Processor

Input 1

Input 2

Figure 10

Streaming Mixer Application

Line

RTP Session Manager

Merge Data Source

Data Source

Data Source

File

Data Sink Manager

Merge Data Source

Data Source

Data Source

Data Source: Microphone, Video Camera or Multimedia Content File
Mixer Record Operation

IsRecord = false

button

IsRecord = !IsRecord

IsRecord = true

no

stop datasink

yes

start datasink

25

26

27

28

29

30
Figure 14

States of Record Operation

Recording

microphone → line

speakers ← line

merge data source

data sink

file

Not Recording

microphone → line

speakers ← line

merge data source

NoOp
Figure 15

Mixer Transmission Operation

```
if IsTrx = false
  button
  if IsTrx = !IsTrx
    if IsTrx = true
      start rtpProcessor
    else
      stop rtpProcessor
  
31
32
33
34
35
36
```
States of Transmit Operation

Transmit

microphone → line

speakers ← line

merge data source

RTP processor

Line

Not Transmit

microphone → line

speakers ← line

merge data source

NoOp
INTERNATIONAL SEARCH REPORT

A. CLASSIFICATION OF SUBJECT MATTER
   IPC(7) : G06F 13/00
   US CL. : 709/232, 709/218, 709/231

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
   U.S. : 709/232, 709/218, 709/231

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
   NONE

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
   EAST, WEST

C. DOCUMENTS CONSIDERED TO BE RELEVANT

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<td>US 6,067,571 A (IGARASHI et al) 23 May 2000 (23.05.2000), column 1, lines 41-63.</td>
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Further documents are listed in the continuation of Box C. See patent family annex.

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